

C.S. Jeffcoat, A.J. Aldykiewicz (Ohio State U.), H.S. Isaacs and M.P. Ryan (BNL, DAS)

Previous measurements have shown that x-ray absorption near edge spectroscopy (XANES) was an efficient tool for determining the ratio of CrIII and CrVI valent species in chromate conversion coatings on aluminum alloys. Data was obtained as a function of time of preparation and exposure. Later studies of conversion coatings have confirmed the application of XANES.

XANES has been used to quantify the spatial distribution of CrVI and CrIII species employing a 20 micrometer monochromatic x-ray beam. Measurements were made with a beam either of a fixed energy that was scanned across a sample or over an energy range to measure XANES at specific sites on the pure aluminum surface. When the position was varied an x-ray energy was chosen at the pre-edge peak (due to CrVI) or at a higher value where the edge height (due to the total amount of Cr present) could be measured.

A wide range of variables were studied again including time of preparation and exposure to specific electrolytes and effects of pretreatment, e.g. cathodic polarization to determine comparative changes and losses of CrIII and CrVI.

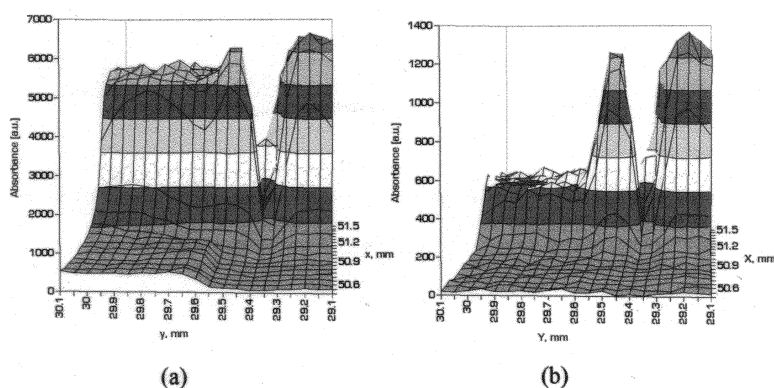


Figure 1. Area scan of a) total Chromium and b) CrVI, distribution over chromate conversion coated pure aluminum partially exposed to sodium sulfite for 800 hours. Left hand side exposed to solution, right hand side of the sample protected. The dip in Cr seen on the unexposed side was due to a scratch through the conversion coating to the underlying metal.